



Analytical Laboratory

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13339 Hagers Ferry Road
Huntersville, NC 28078-7929
McGuire Nuclear Complex - MG03A2
Phone: 980-875-5245 Fax: 980-875-4349

Order Summary Report

Order Number: J13110187

Project Name: WWTS FGD-Routine 2013

Customer Name(s): Bill K, Wayne C, and Melonie M

Customer Address: 3195 Pine Hall Rd
Mailcode: Belews Steam Station
Belews Creek, NC 28012

Lab Contact: Jason C Perkins Phone: 980-875-5348

Report Authorized By: _____ **Date:** 12/5/2013
(Signature) Jason C Perkins

Program Comments:

Please contact the Program Manager (Jason C Perkins) with any questions regarding this report.

Data Flags & Calculations:

Any analytical tests or individual analytes within a test flagged with a Qualifier indicate a deviation from the method quality system or quality control requirement. The qualifier description is found at the end of the Certificate of Analysis (sample results) under the qualifiers heading. All results are reported on a dry weight basis unless otherwise noted. Subcontracted data included on the Duke Certificate of Analysis is to be used as information only. Certified vendor results can be found in the subcontracted lab final report. Duke Energy Analytical Laboratory subcontracts analyses to other vendor laboratories that have been qualified by Duke Energy to perform these analyses except where noted.

Data Package:

This data package includes analytical results that are applicable only to the samples described in this narrative. An estimation of the uncertainty of measurement for the results in the report is available upon request. This report shall not be reproduced, except in full, without the written consent of the Analytical Laboratory. Please contact the Analytical laboratory with any questions. The order of individual sections within this report is as follows:

Job Summary Report, Sample Identification, Technical Validation of Data Package, Analytical Laboratory Certificate of Analysis, Analytical Laboratory QC Reports, Sub-contracted Laboratory Results, Customer Specific Data Sheets, Reports & Documentation, Customer Database Entries, Test Case Narratives, Chain of Custody (COC)

Certification:

The Analytical Laboratory holds the following State Certifications : North Carolina (DENR) Certificate #248, South Carolina (DHEC) Laboratory ID # 99005. Contact the Analytical Laboratory for definitive information about the certification status of specific methods.

Sample ID's & Descriptions:

Sample ID	Plant/Station	Collection Date and Time	Collected By	Sample Description
2013027575	BELEWS	11-Nov-13 7:30 AM	W.WORKMAN	FGD Purge Eff
2013027576	BELEWS	11-Nov-13 7:35 AM	W.WORKMAN	EQ Tank Eff
2013027577	BELEWS	11-Nov-13 7:40 AM	W.WORKMAN	BioReactor 1 Inf
2013027578	BELEWS	11-Nov-13 7:45 AM	W.WORKMAN	BioReactor 2 Inf
2013027579	BELEWS	11-Nov-13 7:50 AM	W.WORKMAN	BioReactor 2 Eff
2013027580	BELEWS	11-Nov-13 8:00 AM	W.WORKMAN	Filter Blk
2013027581	BELEWS	31-Oct-13 2:10 PM	D. Baker	TRIP BLANK
7 Total Samples				

Technical Validation Review

Checklist:

- | | | |
|--|---|--|
| COC and .pdf report are in agreement with sample totals and analyses (compliance programs and procedures). | <input checked="" type="checkbox"/> Yes | <input type="checkbox"/> No |
| All Results are less than the laboratory reporting limits. | <input type="checkbox"/> Yes | <input checked="" type="checkbox"/> No |
| All laboratory QA/QC requirements are acceptable. | <input checked="" type="checkbox"/> Yes | <input type="checkbox"/> No |

Report Sections Included:

- | | |
|---|--|
| <input checked="" type="checkbox"/> Job Summary Report | <input checked="" type="checkbox"/> Sub-contracted Laboratory Results |
| <input checked="" type="checkbox"/> Sample Identification | <input type="checkbox"/> Customer Specific Data Sheets, Reports, & Documentation |
| <input checked="" type="checkbox"/> Technical Validation of Data Package | <input type="checkbox"/> Customer Database Entries |
| <input checked="" type="checkbox"/> Analytical Laboratory Certificate of Analysis | <input checked="" type="checkbox"/> Chain of Custody |
| <input type="checkbox"/> Analytical Laboratory QC Report | <input checked="" type="checkbox"/> Electronic Data Deliverable (EDD) Sent Separatel |

Reviewed By: DBA Account

Date: 12/5/2013

Certificate of Laboratory Analysis

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*This report shall not be reproduced, except in full.***Order # J13110187**

Site: FGD Purge Eff

Collection Date: 11-Nov-13 7:30 AM

Sample #: 2013027575

Matrix: OTHER

Analyte	Result	Units	Qualifiers	RDL	DF	Method	Analysis Date/Time	Analyst
<u>NITRITE + NITRATE (COLORIMETRIC)</u>								
Nitrite + Nitrate (Colorimetric)	6.0	mg-N/L		0.25	25	EPA 353.2	11/15/2013 11:42	BGN9034
<u>INORGANIC IONS BY IC</u>								
Bromide	200	mg/L		5	50	EPA 300.0	11/22/2013 17:02	JAHERMA
<u>MERCURY (COLD VAPOR) IN WATER</u>								
Mercury (Hg)	278	ug/L		5	100	EPA 245.1	11/23/2013 10:34	DKJOHN2
<u>TOTAL RECOVERABLE METALS BY ICP</u>								
Boron (B)	229	mg/L		0.5	10	EPA 200.7	11/14/2013 10:01	MHH7131
<u>DISSOLVED METALS BY ICP-MS</u>								
Selenium (Se)	792	ug/L		10	10	EPA 200.8	11/26/2013 14:02	DJSULL1
<u>TOTAL RECOVERABLE METALS BY ICP-MS</u>								
Arsenic (As)	372	ug/L		10	10	EPA 200.8	11/20/2013 12:03	DJSULL1
Cadmium (Cd)	< 10	ug/L		10	10	EPA 200.8	11/20/2013 12:03	DJSULL1
Chromium (Cr)	615	ug/L		10	10	EPA 200.8	11/20/2013 12:03	DJSULL1
Copper (Cu)	259	ug/L		10	10	EPA 200.8	11/20/2013 12:03	DJSULL1
Nickel (Ni)	382	ug/L		10	10	EPA 200.8	11/20/2013 12:03	DJSULL1
Selenium (Se)	4990	ug/L		20	20	EPA 200.8	11/20/2013 12:03	DJSULL1
Silver (Ag)	< 10	ug/L		10	10	EPA 200.8	11/20/2013 12:03	DJSULL1
Zinc (Zn)	478	ug/L		10	10	EPA 200.8	11/20/2013 12:03	DJSULL1
<u>SELENIUM SPECIATION - (Analysis Performed by Applied Speciation and Consulting, LLC)</u>								
Vendor Parameter	Complete					Vendor Method	V_AS&C	

Site: EQ Tank Eff

Collection Date: 11-Nov-13 7:35 AM

Sample #: 2013027576

Matrix: OTHER

Analyte	Result	Units	Qualifiers	RDL	DF	Method	Analysis Date/Time	Analyst
<u>MERCURY (COLD VAPOR) IN WATER</u>								
Mercury (Hg)	134	ug/L		2.5	50	EPA 245.1	11/23/2013 10:36	DKJOHN2
<u>TOTAL RECOVERABLE METALS BY ICP</u>								
Boron (B)	217	mg/L		0.5	10	EPA 200.7	11/14/2013 10:05	MHH7131
<u>DISSOLVED METALS BY ICP-MS</u>								
Selenium (Se)	461	ug/L		10	10	EPA 200.8	11/26/2013 14:05	DJSULL1

Certificate of Laboratory Analysis

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*This report shall not be reproduced, except in full.***Order # J13110187**

Site: EQ Tank Eff

Collection Date: 11-Nov-13 7:35 AM

Sample #: 2013027576

Matrix: OTHER

Analyte	Result	Units	Qualifiers	RDL	DF	Method	Analysis Date/Time	Analyst
TOTAL RECOVERABLE METALS BY ICP-MS								
Arsenic (As)	238	ug/L		10	10	EPA 200.8	11/20/2013 12:06	DJSULL1
Cadmium (Cd)	< 10	ug/L		10	10	EPA 200.8	11/20/2013 12:06	DJSULL1
Chromium (Cr)	368	ug/L		10	10	EPA 200.8	11/20/2013 12:06	DJSULL1
Copper (Cu)	156	ug/L		10	10	EPA 200.8	11/20/2013 12:06	DJSULL1
Nickel (Ni)	260	ug/L		10	10	EPA 200.8	11/20/2013 12:06	DJSULL1
Selenium (Se)	3390	ug/L		10	10	EPA 200.8	11/20/2013 12:06	DJSULL1
Silver (Ag)	< 10	ug/L		10	10	EPA 200.8	11/20/2013 12:06	DJSULL1
Zinc (Zn)	303	ug/L		10	10	EPA 200.8	11/20/2013 12:06	DJSULL1

Site: BioReactor 1 Inf

Collection Date: 11-Nov-13 7:40 AM

Sample #: 2013027577

Matrix: OTHER

Analyte	Result	Units	Qualifiers	RDL	DF	Method	Analysis Date/Time	Analyst
NITRITE + NITRATE (COLORIMETRIC)								
Nitrite + Nitrate (Colorimetric)	5.4	mg-N/L		0.25	25	EPA 353.2	11/15/2013 11:43	BGN9034
Mercury by EPA 200.8 - (Analysis Performed by Applied Speciation and Consulting, LLC)								
Vendor Parameter	Complete	ug/l				Vendor Method		V_AS&C
TOTAL RECOVERABLE METALS BY ICP								
Boron (B)	191	mg/L		0.5	10	EPA 200.7	11/14/2013 10:10	MHH7131
DISSOLVED METALS BY ICP-MS								
Selenium (Se)	495	ug/L		10	10	EPA 200.8	11/26/2013 14:08	DJSULL1
TOTAL RECOVERABLE METALS BY ICP-MS								
Arsenic (As)	< 10	ug/L		10	10	EPA 200.8	11/20/2013 12:10	DJSULL1
Cadmium (Cd)	< 10	ug/L		10	10	EPA 200.8	11/20/2013 12:10	DJSULL1
Chromium (Cr)	< 10	ug/L		10	10	EPA 200.8	11/20/2013 12:10	DJSULL1
Copper (Cu)	< 10	ug/L		10	10	EPA 200.8	11/20/2013 12:10	DJSULL1
Nickel (Ni)	13.2	ug/L		10	10	EPA 200.8	11/20/2013 12:10	DJSULL1
Selenium (Se)	603	ug/L		10	10	EPA 200.8	11/20/2013 12:10	DJSULL1
Silver (Ag)	< 10	ug/L		10	10	EPA 200.8	11/20/2013 12:10	DJSULL1
Zinc (Zn)	< 10	ug/L		10	10	EPA 200.8	11/20/2013 12:10	DJSULL1
SELENIUM SPECIATION - (Analysis Performed by Applied Speciation and Consulting, LLC)								
Vendor Parameter	Complete					Vendor Method		V_AS&C

Certificate of Laboratory Analysis

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*This report shall not be reproduced, except in full.***Order # J13110187**

Site: BioReactor 2 Inf

Collection Date: 11-Nov-13 7:45 AM

Sample #: 2013027578

Matrix: OTHER

Analyte	Result	Units	Qualifiers	RDL	DF	Method	Analysis Date/Time	Analyst
<u>Mercury by EPA 200.8 - (Analysis Performed by Applied Speciation and Consulting, LLC)</u>								
Vendor Parameter	Complete	ug/l				Vendor Method		V_AS&C
<u>TOTAL RECOVERABLE METALS BY ICP</u>								
Boron (B)	191	mg/L		0.5	10	EPA 200.7	11/14/2013 10:14	MHH7131
<u>TOTAL RECOVERABLE METALS BY ICP-MS</u>								
Arsenic (As)	< 10	ug/L		10	10	EPA 200.8	11/20/2013 12:13	DJSULL1
Cadmium (Cd)	< 10	ug/L		10	10	EPA 200.8	11/20/2013 12:13	DJSULL1
Chromium (Cr)	< 10	ug/L		10	10	EPA 200.8	11/20/2013 12:13	DJSULL1
Copper (Cu)	< 10	ug/L		10	10	EPA 200.8	11/20/2013 12:13	DJSULL1
Nickel (Ni)	< 10	ug/L		10	10	EPA 200.8	11/20/2013 12:13	DJSULL1
Selenium (Se)	< 10	ug/L		10	10	EPA 200.8	11/20/2013 12:13	DJSULL1
Silver (Ag)	< 10	ug/L		10	10	EPA 200.8	11/20/2013 12:13	DJSULL1
Zinc (Zn)	< 10	ug/L		10	10	EPA 200.8	11/20/2013 12:13	DJSULL1

Site: BioReactor 2 Eff

Collection Date: 11-Nov-13 7:50 AM

Sample #: 2013027579

Matrix: OTHER

Analyte	Result	Units	Qualifiers	RDL	DF	Method	Analysis Date/Time	Analyst
<u>NITRITE + NITRATE (COLORIMETRIC)</u>								
Nitrite + Nitrate (Colorimetric)	< 0.01	mg-N/L		0.01	1	EPA 353.2	11/15/2013 11:45	BGN9034
<u>INORGANIC IONS BY IC</u>								
Bromide	200	mg/L		5	50	EPA 300.0	11/22/2013 17:21	JAHERMA
<u>Mercury by EPA 200.8 - (Analysis Performed by Applied Speciation and Consulting, LLC)</u>								
Vendor Parameter	Complete	ug/l				Vendor Method		V_AS&C
<u>TOTAL RECOVERABLE METALS BY ICP</u>								
Boron (B)	187	mg/L		0.5	10	EPA 200.7	11/14/2013 10:18	MHH7131
<u>TOTAL RECOVERABLE METALS BY ICP-MS</u>								
Arsenic (As)	< 5	ug/L		5	5	EPA 200.8	11/20/2013 12:16	DJSULL1
Cadmium (Cd)	< 5	ug/L		5	5	EPA 200.8	11/20/2013 12:16	DJSULL1
Chromium (Cr)	< 5	ug/L		5	5	EPA 200.8	11/20/2013 12:16	DJSULL1
Copper (Cu)	< 5	ug/L		5	5	EPA 200.8	11/20/2013 12:16	DJSULL1
Nickel (Ni)	< 5	ug/L		5	5	EPA 200.8	11/20/2013 12:16	DJSULL1
Selenium (Se)	5.12	ug/L		5	5	EPA 200.8	11/20/2013 12:16	DJSULL1
Silver (Ag)	< 5	ug/L		5	5	EPA 200.8	11/20/2013 12:16	DJSULL1
Zinc (Zn)	< 5	ug/L		5	5	EPA 200.8	11/20/2013 12:16	DJSULL1

Certificate of Laboratory Analysis

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*This report shall not be reproduced, except in full.***Order # J13110187**

Site: BioReactor 2 Eff
Collection Date: 11-Nov-13 7:50 AM

Sample #: 2013027579
Matrix: OTHER

Analyte	Result	Units	Qualifiers	RDL	DF	Method	Analysis Date/Time	Analyst
<u>SELENIUM SPECIATION - (Analysis Performed by Applied Speciation and Consulting, LLC)</u>								
Vendor Parameter	Complete					Vendor Method		V_AS&C
<u>TOTAL DISSOLVED SOLIDS</u>								
TDS	14000	mg/L		25	1	SM2540C	11/19/2013 14:19	DSBAKE1

Site: Filter Blk
Collection Date: 11-Nov-13 8:00 AM

Sample #: 2013027580
Matrix: OTHER

Analyte	Result	Units	Qualifiers	RDL	DF	Method	Analysis Date/Time	Analyst
<u>DISSOLVED METALS BY ICP-MS</u>								
Selenium (Se)	< 1	ug/L	B2	1	1	EPA 200.8	11/26/2013 13:52	DJSULL1

Site: TRIP BLANK
Collection Date: 31-Oct-13 2:10 PM

Sample #: 2013027581
Matrix: OTHER

Analyte	Result	Units	Qualifiers	RDL	DF	Method	Analysis Date/Time	Analyst
<u>TOTAL RECOVERABLE METALS BY ICP</u>								
Boron (B)	< 0.05	mg/L		0.05	1	EPA 200.7	11/14/2013 09:27	MHH7131
<u>TOTAL RECOVERABLE METALS BY ICP-MS</u>								
Arsenic (As)	< 1	ug/L		1	1	EPA 200.8	11/20/2013 11:42	DJSULL1
Cadmium (Cd)	< 1	ug/L		1	1	EPA 200.8	11/20/2013 11:42	DJSULL1
Chromium (Cr)	< 1	ug/L		1	1	EPA 200.8	11/20/2013 11:42	DJSULL1
Copper (Cu)	< 1	ug/L		1	1	EPA 200.8	11/20/2013 11:42	DJSULL1
Nickel (Ni)	< 1	ug/L		1	1	EPA 200.8	11/20/2013 11:42	DJSULL1
Selenium (Se)	< 1	ug/L		1	1	EPA 200.8	11/20/2013 11:42	DJSULL1
Silver (Ag)	< 1	ug/L		1	1	EPA 200.8	11/20/2013 11:42	DJSULL1
Zinc (Zn)	< 1	ug/L		1	1	EPA 200.8	11/20/2013 11:42	DJSULL1

Qualifiers:

- B2** Target analyte was detected in blank(s) at a concentration greater than ½ the reporting limit but less than the reporting limit. Analyte concentration in sample is valid and may be used for compliance purposes.



**APPLIED SPECIATION
AND CONSULTING, LLC**

18804 Northcreek Parkway Bothell, WA, 98011
Tel: (425) 483-3300 Fax: (425) 483-9818
www.appliedspeciation.com

December 3, 2013

Jay Perkins
Duke Energy Analytical Laboratory
Mail Code MGO3A2 (Building 7405)
13339 Hagers Ferry Rd.
Huntersville, NC 28078
(704) 875-5245

Project: Belews - FGD WWTS (Bi-Monthly & Flex Fuel & DSI) (LIMS#J13110187)

Mr. Perkins,

Attached is the report associated with four (4) aqueous samples submitted for total mercury and selenium speciation analysis on November 13, 2013. The samples were received in a sealed cooler at 0.1°C on November 14, 2013. Selenium speciation analysis was performed via ion chromatography inductively coupled plasma collision reaction cell mass spectrometry (IC-ICP-CRC-MS). Mercury quantitation was performed via cold vapor inductively coupled plasma mass spectrometry (CV-ICP-MS). Any issues associated with the analysis are addressed in the following report.

If you have any questions, please feel free to contact me at your convenience.

Sincerely,

A handwritten signature in black ink, appearing to read "Jeremy Maute".

Jeremy Maute
Project Coordinator
Applied Speciation and Consulting, LLC

Applied Speciation and Consulting, LLC

Report prepared for:

Jay Perkins
Duke Energy Analytical Laboratory
Mail Code MGO3A2 (Building 7405)
13339 Hagers Ferry Rd.
Huntersville, NC 28078

Project: Belews - FGD WWTS (Bi-Monthly & Flex Fuel & DSI) (LIMS# J13110187)

December 3, 2013

1. Sample Reception

Four (4) aqueous samples were submitted for selenium speciation analysis on November 13, 2013. Three (3) additional samples were submitted for total mercury quantitation. All samples were received in acceptable condition on November 14, 2013 in a sealed container at 0.1°C.

All samples were received in a laminar flow clean hood, void of trace metals contamination and ultra-violet radiation, and were designated discrete sample identifiers. The 40mL borosilicate glass vials submitted for total mercury were preserved with bromine monochloride (BrCl) solution. The resulting samples were stored in a secure polyethylene container, known to be free from trace metals contamination, until the analyses could be performed.

An aliquot of each sample requiring selenium speciation evaluation was filtered (0.45µm) and each filtrate was stored in a secure, monitored cryofreezer (maintained at a temperature of -80°C) until selenium speciation analysis could be performed via ion chromatography inductively coupled plasma collision reaction cell mass spectrometry (IC-ICP-CRC-MS).

Two 40 mL glass vials were received that listed a LIMS ID of 2013027570. Both bottles were labeled with a sample ID of BioReactor 2 Inf and both bottles listed a collection date/time of (11/8/13, 0955). These descriptive parameters match the BioReactor 2 Inf sample entry on the chain-of-custody (COC) form associated with LIMS ID J13110185. There was no way to discern between the two samples visibly. The COC form associated with LIMS ID J13110187 was also present in the cooler and the COC indicated that the client sample (requesting total mercury analysis) identified as (2013027578, BioReactor 2 Inf, 11/11/13, 0745) should be present. A 40 mL glass container with the client sample BioReactor 2 Inf (LIMS ID 2013027578) was absent from the cooler. The two identically labeled samples requesting total mercury analysis were labeled internally by the laboratory sample reception staff at Applied Speciation as (2013027570-BioReactor 2 Inf A) and

(2013027570-BioReactor 2 Inf B). The samples were analyzed for total mercury yielding similar values, 0.0363 µg/L and 0.0296 µg/L, respectively.

The client was informed of this sample ID issue. Since the total mercury results were similar in quantity, Applied Speciation was directed to report the total mercury result for (2013027570-BioReactor 2 Inf A) in the report associated with LIMS ID J13110185. Applied Speciation was instructed to report the total mercury result for (2013027570-BioReactor 2 Inf B) in the report associated with LIMS ID J13110187.

2. Sample Preparation

All sample preparation is performed in laminar flow clean hoods known to be free from trace metals contamination. All applied water for dilutions and sample preservatives are monitored for contamination to account for any biases associated with the sample results.

Total Mercury Quantitation by CV-ICP-MS All samples and preparation blanks for total mercury quantitation were preserved with 2% (v/v) BrCl. The resulting samples were analyzed for mercury via cold vapor inductively coupled plasma mass spectrometry (CV-ICP-MS).

Selenium Speciation Analysis by IC-ICP-CRC-MS Prior to analysis, an aliquot of each sample was filtered with a syringe filter (0.45µm) and injected directly into a sealed autosampler vial. No further sample preparation was performed as any chemical alteration of a sample may shift the equilibrium of the system, resulting in changes in speciation ratios.

3. Sample Analysis

All sample analysis is preceded by a minimum of a five-point calibration curve spanning the entire concentration range of interest. Calibration curves are performed at the beginning of each analytical day. All calibration curves, associated with each species of interest, are standardized by linear regression resulting in a response factor. All sample results are **instrument blank corrected** to account for any operational biases associated with the analytical platform.

Prior to sample analysis, all calibration curves are verified using second source standards which are identified as initial calibration verification standards (ICV).

Ongoing instrument performance is identified by the analysis of continuing calibration verification standards (CCV) and continuing calibration blanks (CCB) at a minimum interval of every ten analytical runs.

Total Mercury Quantitation by CV-ICP-MS The sample fractions for total mercury quantitation were analyzed by cold vapor inductively coupled plasma mass spectrometry (CV-ICP-MS) on November 18, 2013. Aliquots of each sample are reacted with a reductant in-line and transported to a gas-liquid separator. The volatile elemental mercury that is

formed is then swept by a stream of argon gas into a radio frequency (RF) plasma where energy-transfer processes cause desolvation, atomization, and ionization. The ions are extracted from the plasma through a differentially-pumped vacuum interface and separated on the basis of their mass-to-charge ratio (m/z) by a mass spectrometer. A solid-state detector detects ions transmitted through the mass analyzer and the resulting current is processed by a data handling system.

Selenium Speciation Analysis by IC-ICP-CRC-MS Each sample for selenium speciation analysis was analyzed by ion chromatography inductively coupled plasma collision reaction cell mass spectrometry (IC-ICP-CRC-MS) on November 19, 2013. An aliquot of each sample is injected onto an anion exchange column and mobilized by a basic ($\text{pH} > 7$) gradient. The eluting selenium species are then introduced into a radio frequency (RF) plasma where energy-transfer processes cause desolvation, atomization, and ionization. The ions are extracted from the plasma through a differentially-pumped vacuum interface and travel through a pressurized chamber (CRC) containing a reaction gas which preferentially reacts with interfering ions of the same target mass to charge ratios (m/z). A solid-state detector detects ions transmitted through the mass analyzer and the resulting current is processed by a data handling system.

Retention times for each eluting species are compared to known standards for species identification.

4. Analytical Issues

The overall analyses went well and no significant analytical issues were encountered. All quality control parameters associated with these samples were within acceptance limits.

The estimated method detection limits (eMDLs) for selenite, selenate, and selenocyanate are generated from replicate analyses of the lowest standard in the calibration curve. Not all selenium species are present in preparation blanks; therefore, eMDL calculations based on preparation blanks are artificially biased low.

The eMDL for methylseleninic acid and selenomethionine is calculated from the average eMDL of selenite, selenate, and selenocyanate. The calibration does not contain methylseleninic acid or selenomethionine due to impurities in these standards which would bias the results for other selenium species.

The eMDL for mercury has been calculated using the standard deviation of the preparation blanks preserved and analyzed concurrently with the submitted samples.

If you have any questions or concerns regarding this report, please feel free to contact me.

Sincerely,

A handwritten signature in black ink, appearing to read 'J. Maute', with a stylized flourish extending to the right.

Jeremy Maute
Project Coordinator
Applied Speciation and Consulting, LLC

Total Mercury & Selenium Speciation Results for Duke Energy
 Project Name: Belews - FGD WWTS (Bi-Monthly & Flex Fuel & DSI)
 Contact: Jay Perkins
 LIMS #J13110187

Date: December 3, 2013
 Report Generated by: Jeremy Maute
 Applied Speciation and Consulting, LLC

Sample Results

Sample ID	Total Hg	Se(IV)	Se(VI)	SeCN	MeSe(IV)	SeMe	Unknown Se Species (n)
FGD Purge Eff	NR	1280	30.5	13.3	4.5	ND (< 1.7)	3.4 (1)
BioReactor 1 Inf	0.0765	489	19.6	ND (< 0.53)	6.40	ND (< 0.43)	1.20 (1)
BioReactor 2 Inf	0.0296	NR	NR	NR	NR	NR	NR
BioReactor 2 Eff	0.0054	ND (< 0.47)	ND (< 0.30)	ND (< 0.53)	ND (< 0.43)	ND (< 0.43)	0 (0)

All results reflect the applied dilution and are reported in µg/L

NR = Analysis not requested

ND = Not detected at the applied dilution

SeCN = Selenocyanate

MeSe(IV) = Methylseleninic acid

SeMe = Selenomethionine

Unknown Se Species = Total concentration of all unknown Se species observed by IC-ICP-MS

n = number of unknown Se species observed

Total Mercury & Selenium Speciation Results for Duke Energy
 Project Name: Belews - FGD WWTS (Bi-Monthly & Flex Fuel & DSI)
 Contact: Jay Perkins
 LIMS #J13110187

Date: December 3, 2013
 Report Generated by: Jeremy Maute
 Applied Speciation and Consulting, LLC

Quality Control Summary - Preparation Blank Summary

Analyte (µg/L)	PBW1	PBW2	PBW3	PBW4	Mean	StdDev	eMDL*	eMDL 5x	eMDL 250x	eMDL 1000x
Hg	-0.0003	-0.0002	-0.0007	-0.0004	-0.0004	0.0002	0.0001	0.0006	-	-
Se(IV)	0.000	0.000	0.000	0.000	0.000	0.000	0.002	-	0.47	1.9
Se(VI)	0.000	0.000	0.000	0.000	0.000	0.000	0.001	-	0.30	1.2
SeCN	0.000	0.000	0.000	0.000	0.000	0.000	0.002	-	0.53	2.1
MeSe(IV)	0.000	0.000	0.000	0.000	0.000	0.000	0.002	-	0.43	1.7
SeMe	0.000	0.000	0.000	0.000	0.000	0.000	0.002	-	0.43	1.7

eMDL = Estimated Method Detection Limit

*Please see narrative regarding eMDL calculations

Quality Control Summary - Certified Reference Materials

Analyte (µg/L)	CRM	True Value	Result	Recovery
Hg	NIST 1641d	1568	1626	103.7
Se(IV)	LCS	9.57	9.28	96.9
Se(VI)	LCS	9.48	9.22	97.3
SeCN	LCS	8.92	8.55	95.9
MeSe(IV)	LCS	6.47	6.23	96.3
SeMe	LCS	9.32	8.84	94.8

Total Mercury & Selenium Speciation Results for Duke Energy
 Project Name: Belews - FGD WWTS (Bi-Monthly & Flex Fuel & DSI)
 Contact: Jay Perkins
 LIMS #J13110187

Date: December 3, 2013
 Report Generated by: Jeremy Maute
 Applied Speciation and Consulting, LLC

Quality Control Summary - Matrix Duplicates

Analyte (µg/L)	Sample ID	Rep 1	Rep 2	Mean	RPD
Hg	Batch QC	0.1934	0.1955	0.1945	1.1
Se(IV)	Batch QC	ND (< 0.47)	ND (< 0.47)	NC	NC
Se(VI)	Batch QC	ND (< 0.30)	ND (< 0.30)	NC	NC
SeCN	Batch QC	ND (< 0.53)	ND (< 0.53)	NC	NC
MeSe(IV)	Batch QC	ND (< 0.43)	ND (< 0.43)	NC	NC
SeMe	Batch QC	ND (< 0.43)	ND (< 0.43)	NC	NC

ND = Not detected at the applied dilution

NC = Value was not calculated due to one or more concentrations below the eMDL

Quality Control Summary - Matrix Spike/ Matrix Spike Duplicate

Analyte (µg/L)	Sample ID	Spike Conc	MS Result	Recovery	Spike Conc	MSD Result	Recovery	RPD
Hg	Batch QC	2.000	2.347	107.6	2.000	2.320	106.3	1.2
Se(IV)	Batch QC	1390	1336	96.1	1390	1344	96.7	0.6
Se(VI)	Batch QC	1261	1176	93.3	1261	1190	94.3	1.1
SeCN	Batch QC	1144	1026	89.7	1144	1043	91.2	1.7

CHAIN OF CUSTODY RECORD AND ANALYSIS REQUEST FORM

pg 2 of 3

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DISTRIBUTION
ORIGINAL TO LAB,
COPY TO CLIENT

DUKE ENERGY®
Duke Energy Analytical Laboratory
Mail Code MG03A2 (Building 7405)
13339 Hagers Ferry Rd
Huntersville, N.C. 28078
(704) 875-5245
Fax: (704) 875-4349

1) Project Name: **Belews - FGD**
2) Client: **WWTS (Bi-Monthly & Flex Fuel & DSI)**
3) Business Unit: **20003**
4) Oper. Unit: **BC00**
5) Process: **BMCFEGD**
6) Res. Type: **Mail Code:**
7) Res. Center: **10) Res. Center:**

8) Project No: **Use Project: WWTS FGD-Routine 2013**
9) Client: **Bill Kennedy, Melonie Martin, Wayne Chapman**

ORDER# **51312187**
Date & Time: **4/12/13**
Logged By: **DM**
Matrix: OTHER
Samples Originating From: **NC SC**
SAMPLE PROGRAM: **Water**
Ground NPDES: **Drinking Water**
RCRA Waste: **UST**
Cooler Temp. (C): **1.2**
15) Preserv.: 1=HCl, 2=H₂SO₄, 3=HNO₃, 4=H₂O, 5=Noble
PO # **650910**

LAB USE ONLY

11) Lab ID	243027575
	243027576
	243027577
	243027578
	243027579
	243027580
	243027581

Se Speciation Bottle ID	13) Sample Description or ID
	FGD Purge Eff
	EQ Tank Eff.
	BioReactor 1 Inf
	BioReactor 2 Inf
	BioReactor 2 Eff
	Filter Bk
	Metals Trip Bk

Date	Time	Signature	17) Comp.	18) Grab	TDS	Br (Dionex)	Metals + Hg 245 1**	Se (IMS), filtered	NO3-NO2	Hg 200.8 (V-AS&C)	Se, speciation - vendor to bottle back into both baggies
4/11/13	7:30	(N. Work)				1	1	1	1		1
7:35							1	1			
7:40							1**	1	1		1
7:45							1**			1	
7:50							1	1	1		1
8:00								1			
10/31/13	1410	D. Bal.					1**				

Filtering of the Se is performed in the field please provide a filter blank too.

1) Relinquished By: **Ph. Gosssett** Date/Time: **4-11-13 15:00**
2) Accepted By: **[Signature]** Date/Time: **4/12/13 1300**
3) Relinquished By: **[Signature]** Date/Time: **4/13/13 1315**
4) Accepted By: **[Signature]** Date/Time: **4/13/13 1315**
5) Relinquished By: **[Signature]** Date/Time: **4/13/13 1:50**
6) Accepted By: **[Signature]** Date/Time: **4/13/13 1:50**
7) Relinquished By: **[Signature]** Date/Time: **4/13/13 1:50**
8) Accepted By: **[Signature]** Date/Time: **4/13/13 1:50**
9) Seal/lock Broken By: **[Signature]** Date/Time: **4/13/13 1:50**
10) Seal/lock Broken By: **[Signature]** Date/Time: **4/13/13 1:50**
11) Seal/lock Broken By: **[Signature]** Date/Time: **4/13/13 1:50**
12) Seal/lock Broken By: **[Signature]** Date/Time: **4/13/13 1:50**

Comments: **2) Hg sample not present**

Customer to sign & date below - fill out from left to right

1** = No Hg

22) Requested Turnaround: **21 Days**
*7 Days
*48 Hr
*Other: **14 DAY**
*Add Cost Will Apply: **11/25/13**

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Return Kit to Travis Thornton @ Belews

CHAIN OF CUSTODY RECORD AND ANALYSIS REQUEST FORM



Duke Energy Analytical Laboratory

Mail Code MGO3A2 (Building 7405)
13339 Hagers Ferry Rd
Huntersville, N. C. 28078
(704) 875-5245
Fax: (704) 875-4349

1) Project Name Belews - FGD WWTS (Bi-Monthly & Flex Fuel & DSI)		2) Phone No:
2) Client: Bill Kennedy, Melonie Martin, Wayne Chapman		Use Project: WWTS FGD-Routine 2013
5) Business Unit: 20003	6) Process: BMCEFGD	Mail Code:
8) Oper. Unit: BC00	9) Res. Type:	10) Reso. Center:

Customer must Complete

Analytical Laboratory Use Only

ORDER# 51314187	MATRIX: OTHER	Samples Originating From NC SC
Logged By DM	Date & Time 11/12/13	SAMPLE PROGRAM Water Ground NPDES Drinking Water UST RCRA Waste
Cooler Temp (C) 1.2		
15 Preserv.: 1=HCL 2=H ₂ SO ₄ 3=HNO ₃ 4=Ice 5=None		4

19 Page 1 of 2
DISTRIBUTION
ORIGINAL to LAB,
COPY to CLIENT

AS&C
PO #650910

Customer to complete all
appropriate non-shaded areas.

Sampling conducted: 2nd and 4th Wednesday

LAB USE ONLY

11 Lab ID

Se Speciation Bottle

ID

13 Sample Description or ID

Date

Time

Signature

17 Comp.

18 Grab

TDS

Br (Dionex)

Metals* + Hg 245.1**

Se (IMS), filtered

NO3-NO2

Hg 200.8 (V_AS&C)

Se, speciation - vendor to
AS&C (Important to place filled
bottle back into both baggies)

24 302 7575
24 302 7576
24 302 7577
24 302 7578
24 302 7579
24 302 7580
24 302 7581

Customer to complete appropriate columns to right

ID	13 Sample Description or ID	Date	Time	Signature	17 Comp.	18 Grab	TDS	Br (Dionex)	Metals* + Hg 245.1**	Se (IMS), filtered	NO3-NO2	Hg 200.8 (V_AS&C)	Se, speciation - vendor to AS&C (Important to place filled bottle back into both baggies)
	FGD Purge Eff	11/11/13	7:30	W. Work				1	1	1	1		1
	EQ Tank Eff.		7:35						1	1			
	BioReactor 1 Inf		7:40						1**	1	1	1	1
	BioReactor 2 Inf		7:45						1**			1	
	BioReactor 2 Eff		7:50				1	1	1**		1	1	1
	Filter Blk		8:00							1			
	Metals Trip Blk	10/31/13	14:10	D. Bal					1**				

Filtering of the Se is performed in the field please provide a filter blank too.

Return Kit to Travis Thorton @ Belews

Customer to sign & date below - fill out from left to right.

1) Relinquished By Phil Gossett	Date/Time 11-11-13 15:00	2) Accepted By [Signature]	Date/Time 11/12/13 1300
3) Relinquished By [Signature]	Date/Time 11/13/13 1315	4) Accepted By [Signature]	Date/Time
5) Relinquished By	Date/Time	6) Accepted By	Date/Time
7) Relinquished By	Date/Time	8) Accepted By	Date/Time
9) Seal/Locked By	Date/Time	10) Seal/Lock Opened By	Date/Time
11) Seal/Locked By	Date/Time	12) Seal/Lock Opened By	Date/Time
Comments			

Customer, IMPORTANT!
Please indicate desired turnaround.

22 Requested Turnaround

21 Days _____

*7 Days _____

-48 Hr _____

*Other _____
* Add. Cost Will Apply